

FOR NATIONAL PHASE SUBMISSION

2

CLAIM AMENDMENTS

WHAT IS CLAIMED IS:

This listing of the claims will replace all prior versions, and listing, of claims in the application:

1. (Currently Amended) A method for balancing out the differences in the injection quantities between the cylinders in an internal combustion engine whereby, comprising the step of carrying out, for various operating points of the internal combustion engine, an adaptation of the differences in the injection quantities ~~is carried out~~ for at least one selected injection parameter, wherein the dynamics of a selected operating point are limited ~~(step 3)~~ during the adaptation, ~~characterized in that and wherein~~ the differences in the injection quantities are determined for the selected operating point and are learned as adaptation values ~~(step 6)~~ which are assigned to the injection parameter value concerned, and ~~in that~~ for the purpose of limiting the dynamics the injection parameter is set in such a way that the selected operating point remains essentially static.

2. (Currently Amended) ~~The A~~ method ~~as claimed~~ in accordance to claim 1, wherein ~~characterized in that~~ the learned adaptation values are used in calculating correction values individual to each cylinder, which are applied to at least one actuation parameter of an injection device on the internal combustion engine in such a way as to effect a balancing out of the injection quantities, time-traces of the injections and the start of the hydraulic injection.

FOR NATIONAL PHASE SUBMISSION

3

3. (Currently Amended) A method according to claim 2,
wherein The method as claimed in claim 2 characterized in that
the injection device for each cylinder takes the form of an
injector with a piezo-electric actuator, whereby the duration
of the actuation, the time point of actuation and/or the
duration of the recharging time are used as the actuation
parameters.

4. (Currently Amended) A method according to claim 3,
wherein The method as claimed in claim 3 characterized in that
for each cylinder the start (t_3) of the discharge of the
corresponding piezo-electric actuator takes place at the same
crankshaft angle relative to top-dead-center for the
corresponding piston of the internal combustion engine.

5. (Currently Amended) A method according to claim 3,
wherein The method as claimed in at least one of the claims 3
or 4 characterized in that for each cylinder the end (t_2) of
the recharging of the corresponding piezo-electric actuator
takes place at the same crankshaft angle relative to top-dead-
center for the corresponding piston of the internal combustion
engine.

6. (Currently Amended) A method according to claim 1,
wherein The method as claimed in at least one of the preceding
claims characterized in that the durations of the discharge
times ($t_{10''}$, $t_{11''}$) of all the actuators are the same.

FOR NATIONAL PHASE SUBMISSION

4

7. (Currently Amended) A method according to claim 3,
wherein ~~The method as claimed in at least one of the claims 3~~
~~to 6 characterized in that~~ the start and the duration of the
recharging of the piezo-electric actuator are set in such a way
that the actuator signal ~~(S1, S2)~~ which is generated for each
injector occurs at the same crankshaft angle relative to top-
dead-center for the corresponding piston of the internal
combustion engine.

8. (Currently Amended) A method according to claim 1,
wherein ~~The method as claimed in at least one of the preceding~~
~~claims characterized in that~~ the selected operating point is
located in the no-load, partial load or full load region.

9. (NEW) A method for balancing out the differences in
the injection quantities between the cylinders in an internal
combustion engine whereby, comprising the steps of:

adapting, for various operating points of the internal
combustion engine, the differences in the injection quantities
for at least one selected injection parameter,

limiting the dynamics of a selected operating point during
the adaptation,

determining the differences in the injection quantities
for the selected operating point,

learning the differences as adaptation values,
assigning the adaptation values to the injection parameter
value concerned, and

for the purpose of limiting the dynamics, setting the
injection parameter in such a way that the selected operating
point remains essentially static.

FOR NATIONAL PHASE SUBMISSION

5

10. **(NEW)** A method according to claim 9, wherein the learned adaptation values are used in calculating correction values individual to each cylinder, which are applied to at least one actuation parameter of an injection device on the internal combustion engine in such a way as to effect a balancing out of the injection quantities, time-traces of the injections and the start of the hydraulic injection.

11. **(NEW)** A method according to claim 10, wherein the injection device for each cylinder takes the form of an injector with a piezo-electric actuator, whereby the duration of the actuation, the time point of actuation and/or the duration of the recharging time are used as the actuation parameters.

12. **(NEW)** A method according to claim 11, wherein for each cylinder the start of the discharge of the corresponding piezo-electric actuator takes place at the same crankshaft angle relative to top-dead-center for the corresponding piston of the internal combustion engine.

13. **(NEW)** A method according to claim 11, wherein for each cylinder the end of the recharging of the corresponding piezo-electric actuator takes place at the same crankshaft angle relative to top-dead-center for the corresponding piston of the internal combustion engine.

FOR NATIONAL PHASE SUBMISSION

6

14. (NEW) A method according to claim 9, wherein the durations of the discharge times of all the actuators are the same.

15. (NEW) A method according to claim 11, wherein the start and the duration of the recharging of the piezo-electric actuator are set in such a way that the actuator signal which is generated for each injector occurs at the same crankshaft angle relative to top-dead-center for the corresponding piston of the internal combustion engine.

16. (NEW) A method according to claim 9, wherein the selected operating point is located in the no-load, partial load or full load region.

17. (NEW) A system for balancing out the differences in the injection quantities between the cylinders in an internal combustion engine whereby, comprising:

means for adapting, for various operating points of the internal combustion engine, the differences in the injection quantities for at least one selected injection parameter,

means for limiting the dynamics of a selected operating point during the adaptation,

means for determining the differences in the injection quantities for the selected operating point,

means for learning the differences as adaptation values, assigning the adaptation values to the injection parameter value concerned, and

means for setting the injection parameter in such a way that the selected operating point remains essentially static.

FOR NATIONAL PHASE SUBMISSION

7

18. **(NEW)** A system according to claim 17, wherein the learned adaptation values are used in calculating correction values individual to each cylinder, which are applied to at least one actuation parameter of an injection device on the internal combustion engine in such a way as to effect a balancing out of the injection quantities, time-traces of the injections and the start of the hydraulic injection.

19. **(NEW)** A system according to claim 18, wherein an injection device for each cylinder comprises the form of an injector with a piezo-electric actuator, whereby the duration of the actuation, the time point of actuation and/or the duration of the recharging time are used as the actuation parameters.